MXCHIP® | 智能硬件解决方案提供商

Application Note of EMW110

Abstract

This document lists the issues that customers need to be aware of during each phase of designing a product using the MXCHIP module. Customers are familiar with this document, and consider in advance the problems in design, production, programming firmware, testing, and effective evasion, in order to achieve rapid mass production.

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Version

Date	Version	Updated content
2017-Dec-22	V1.0	Initial version
2018-Jan-5	V1.1	Update Figure 2.1 Module Mechanical Dimensions

目录

1.   Overview

This document lists the issues that customers need to be aware of during each phase of designing a product using the MXCHIP module. Customers are familiar with this document, and consider in advance the problems in design, production, programming firmware, testing, and effective evasion, in order to achieve rapid mass production.

Applicable module model:

EMW110 series

Stage to be aware of:

- Hardware design
- Burn firmware
- Test firmware
- Product SMT stage
- Online upgrade

Features of EMW110:

- Each module has a globally unique MAC ID
- Two types of PCB antenna and external antenna
- Single-issue, working on 802.11n, backward compatible with 802.11b/g
- Module supports Wi-Fi Direct connection
- Support EasyLink
- Working temperature：-20℃ to +85℃

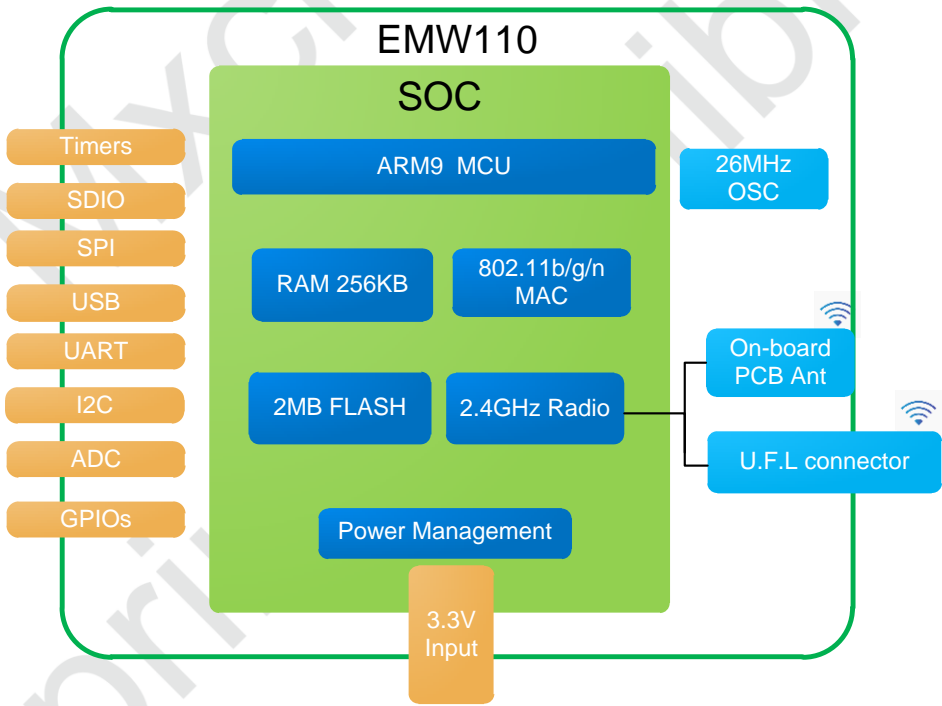**EMW110 front view**

EWM110–E

EWM110-P

Figure 1.1 Module appearance

EMW110 model list

Part Number	Antenna Type	instruction
EMW110-P	PCB antenna	default
EMW110-E	IPEX antenna	Optional

Table 1.1 List of EMW110 Models

硬件原理框图

Hardware block diagram of EMW110

2. Hardware design considerations

2.1 Mechanical Dimensions

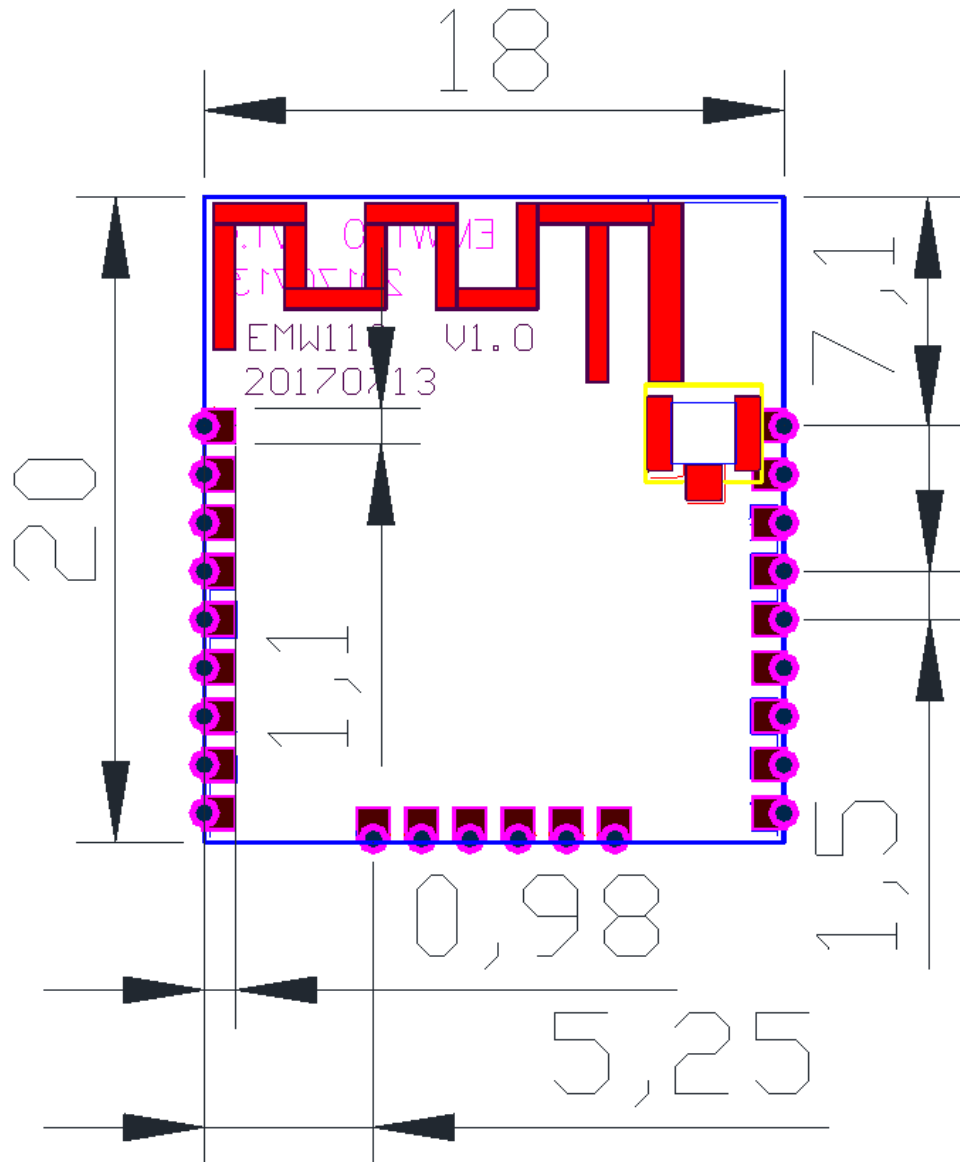The mechanical dimensions of the EMW110 are 18 mm x 20 mm x 3 mm. The mechanical dimensions are shown below (unit: mm)

Figure 2.1 Main view

2.2 Reference package design

EMW110 stamp hole package design, stamp hole package design (shown in Figure 2.2) is convenient for customer debugging, easy to disassemble, providing a variety of choices for customer design.

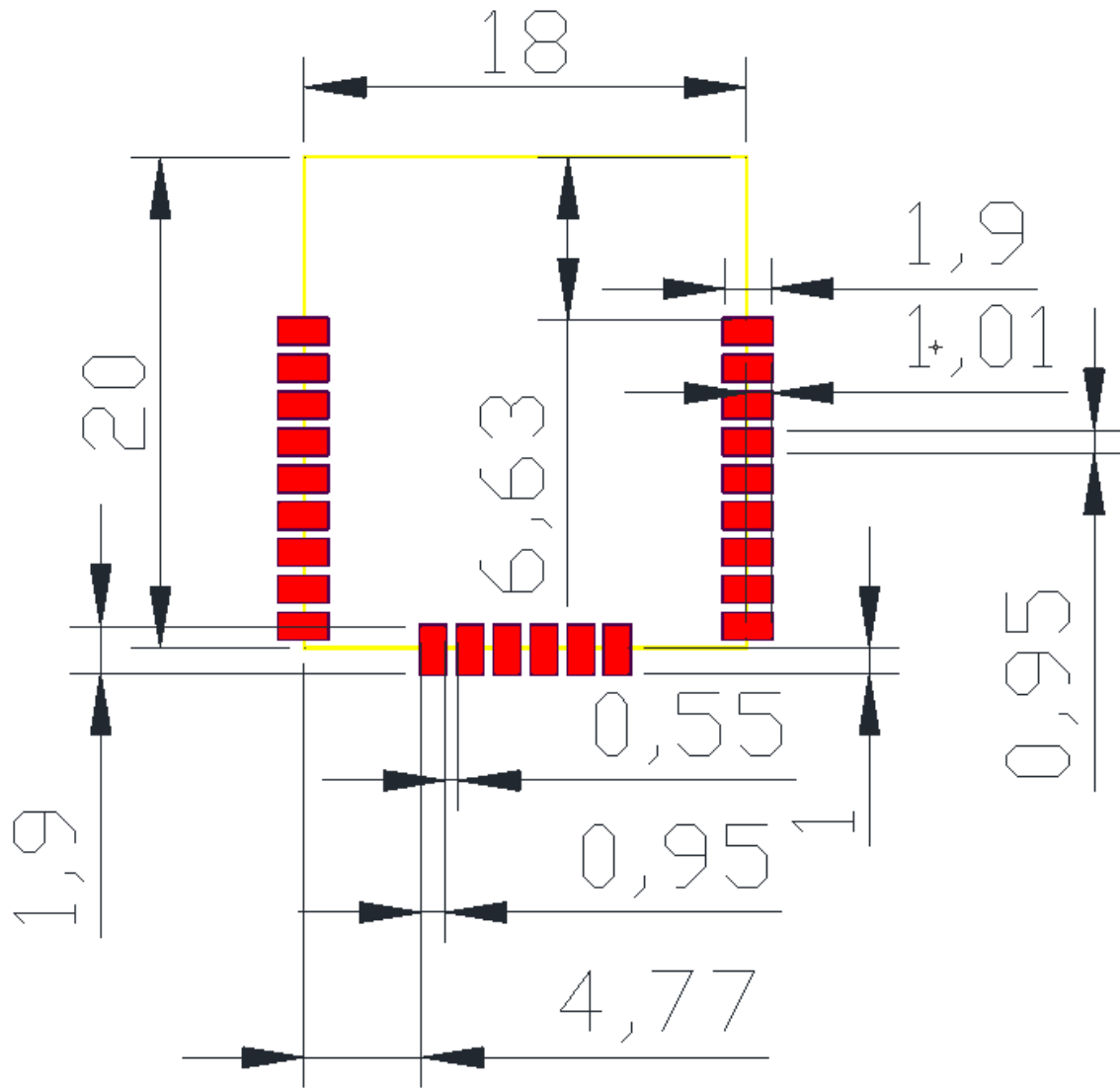Solder mask opening and pad size are the same. SMT recommends steel mesh thickness of 0.15mm.

Figure 2.2 Stamp Hole Package Dimensions (Unit: mm)

2.2 DC power supply design

The peak current of the module is about 300mA. MXCHIP recommends using a DC/DC power supply chip with a maximum output current of 600mA or more. Compared with LDO, DC/DC can better reflect the low power consumption of the module.

For the use of DC/DC power chip, in addition to the requirements of output voltage (3.3V) and maximum current (600mA), pay special attention to wiring, the device is as compact as possible, the input and output grounds require good connection, and the feedback signal is far from the inductor. And Schottky diodes, the specific requirements refer to the corresponding DC / DC power chip's Datasheet.

For the use of LDO, pay attention to the maximum output current (600mA) and heat dissipation. For example, from 5V to 3.3V, the voltage drop is 1.7V. If the current is 300mA, the power consumption converted to heat on the LDO is 1.7V x 300mA = 510mW. One parameter on the LDO Datasheet is Power Dissipation. This parameter must be greater than 510mW (other input voltages are calculated according to this method).

Note: The module operating voltage is DC 3.0~3.6V, and the power supply ripple must be less than 100mV.

Only by fully considering the design of the power supply in the early stage can we reduce the probability that the final product will go wrong in the actual test.

2.3 Reference circuit

The reference circuit of EMW110 is as follows: Figure 2.3 Power Reference Circuit, Figure 2.4 USB to Serial Port Reference Circuit, Figure 2.5 External Interface Reference Design for User Reference
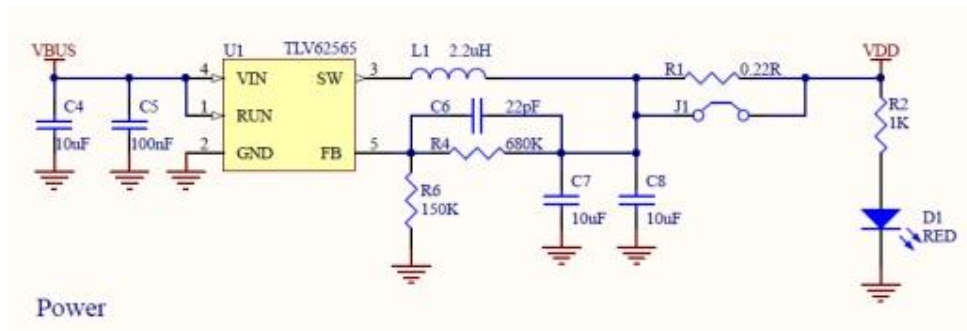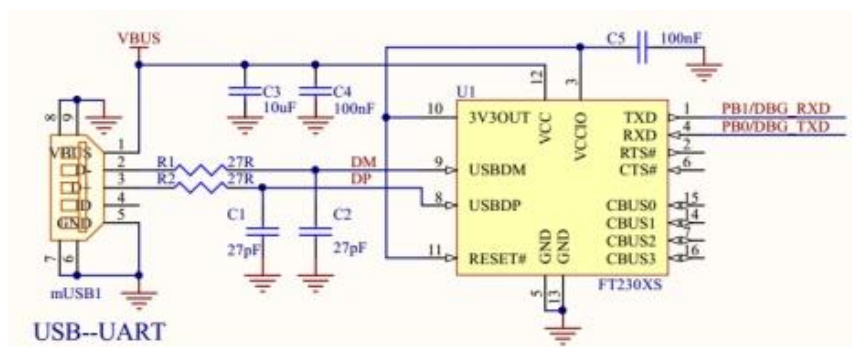
Figure 2.3 Power Reference Circuit

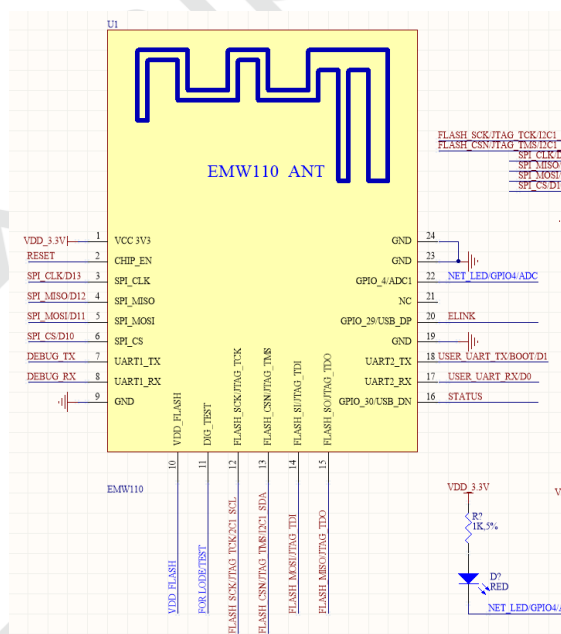Figure 2.4 USB to serial port reference circuit

Figure 2.5 EMW110 External Interface Reference Design

Description：

（1）PIN10 and PIN 11 and PIN 22 pins default to programming mode, PIN18 pin is BOOT, PIN 16 is STATUS pin, PIN7 and 8 pins are used for debugging log information output, PIN20 is ELINK pin, hardware design Please try not to use it if you want to use it, please contact our engineers for confirmation.

（2）The power-on time of the BOOT pin must be H or left floating. Please pay special attention when designing the circuit.

（3）The CHIP_EN pin should be left floating if it is not used. Leave it unconnected if other pins are not used.

（4）PIN14 has high-speed clock output function

The EMW110 UART is a 3.3V UART. If the UART of the chip is 5V, the 5V UART needs to be converted to a 3.3V UART to communicate with the EMW110 UART. For the 5V-3.3V UART conversion circuit, please refer
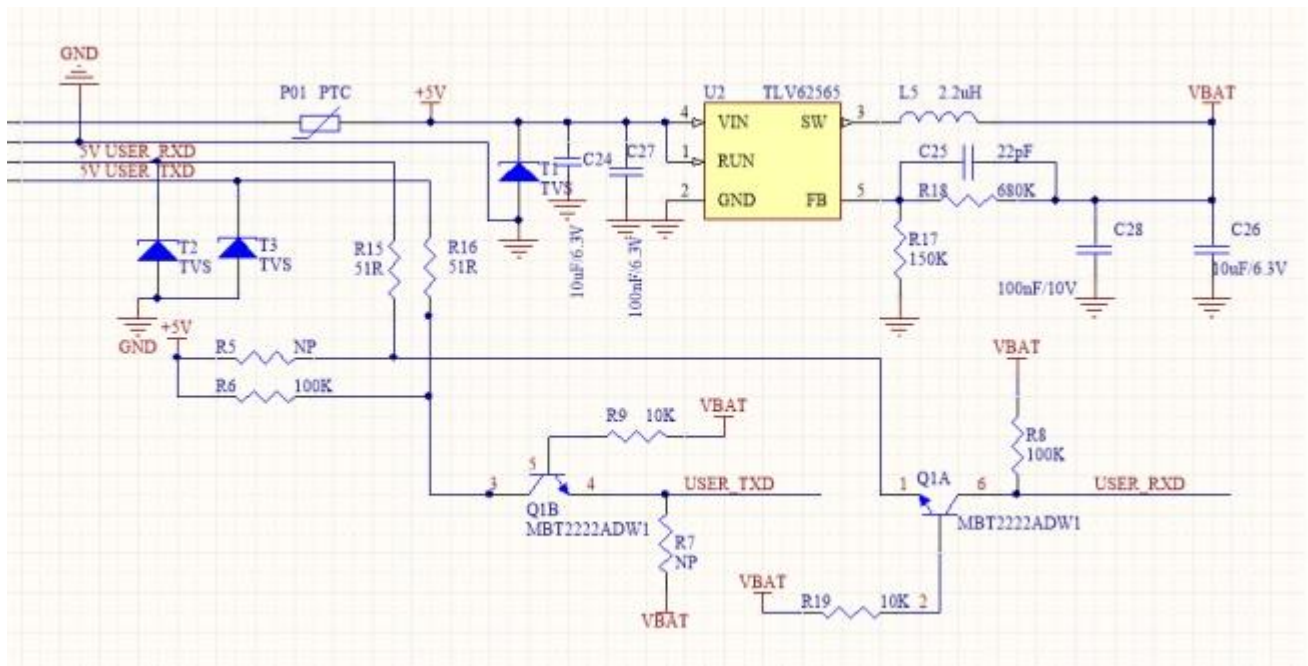
to the circuit shown in Figure 2.6.

Figure 2.6 3.3V UART- 5V UART Conversion Circuit

2.4 RF Design

2.4.1 PCB antenna design

　　Modules with onboard PCB antennas, around the PCB antenna location, need to meet the minimum clearance distance requirements in the figure below. Copper is not allowed in this range, and metal components, sensors, interference sources, and other materials that may cause signal interference are placed.
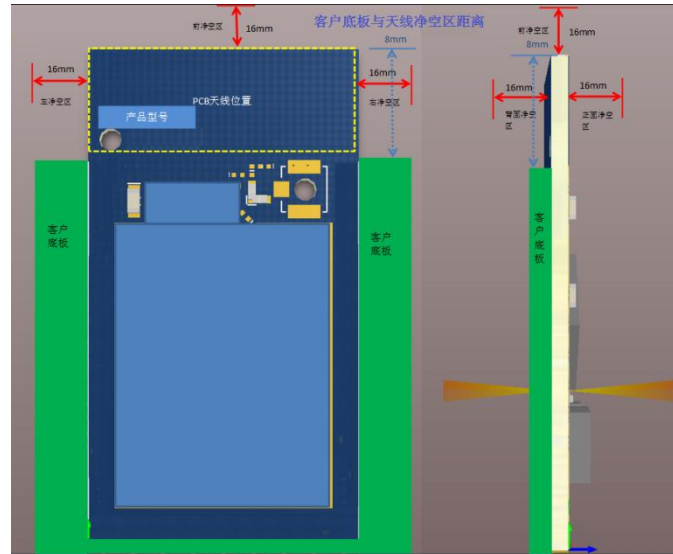
Figure 2.7 PCB antenna minimum clearance area

MXCHIP recommends that customers use the module of the onboard PCB antenna to directly extend the module antenna out of the backplane, reducing the effects of metal components on the PCB antenna and wireless signals. If the module cannot extend out of the bottom plate due to structural constraints, the module must also be placed at the corner of the bottom plate, as shown in Figure 2.8 below, and the PCB under the antenna is hollowed out to ensure RF performance!
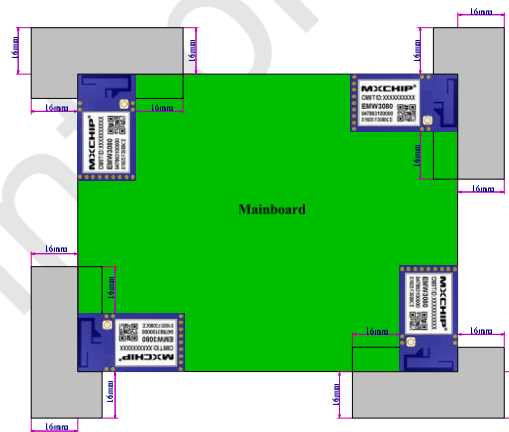

Figure 2.8 The module is placed in the bottom plate

2.4.2 External antenna connector

The figure below shows the dimensions of the external antenna connector on the module. When selecting the connector of the antenna, check with the supplier whether the connector specifications are the same.
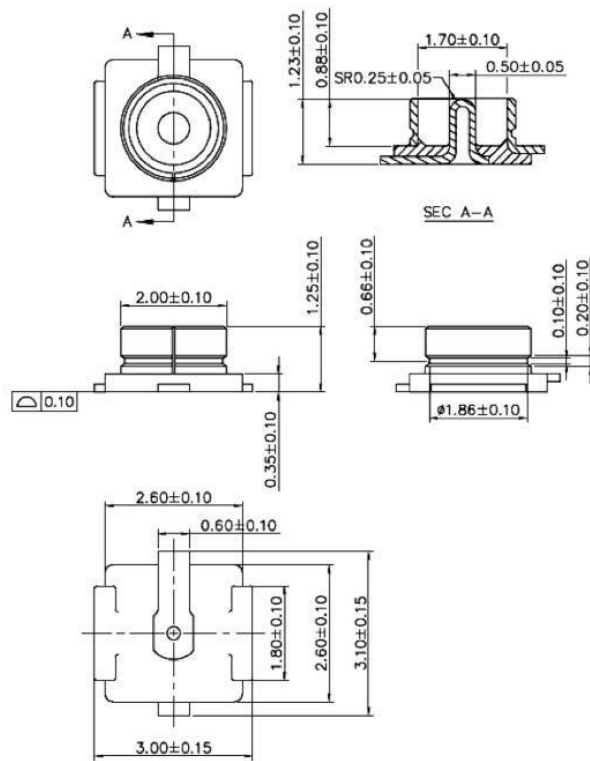
Figure 2.9 External Antenna Connector Dimensions

2.5 ESD design

Module ESD level: 2000V for human body model (HBM) and 500V for device model (CDM). If the product has higher ESD requirements, pay special attention to all pins that may be in contact with the outside world, such as connecting to USB holder, SD. For these connectors such as card slots, the location of the ESD protection device must be reserved.

If the module is not soldered directly or plugged into the board, but is operated by pull-out leads, pay attention to EMI issues, preferably with shielded wires, or where the common mode chokes are reserved on the board.

3. Burn firmware and testing
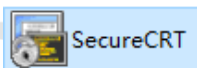
3.1.1 Before burning

Burning method	Burning tool / drive	PC software	instruction manual
Flash_SPI	Tools: computer, EMW110 fixture, Micro USB cable, burn-in board, 2*5 cable	MOC108_CONTROLLER	■ Only support burningfull bin; ■ Suitable for factory burning
bootloader	Drive: CP210x_VCP_Windows	SecureCRT	■ Burn app bin; ■ Suitable for customer firmware upgrades

Table 3.1.1 EMW110 programming method and required tools and software

There are many ways to burn Flash_SPI. It is only suitable for factory burning. It will update all contents in Flash, including RF calibration data. It is not recommended for customers. It is recommended to use the Bootloader upgrade method to upgrade the module firmware.

3.1.2 Bootloader burning

■   First，connecting the device and module，see below pic.

Figure 3.1 EMW110 fixture connected to the computer

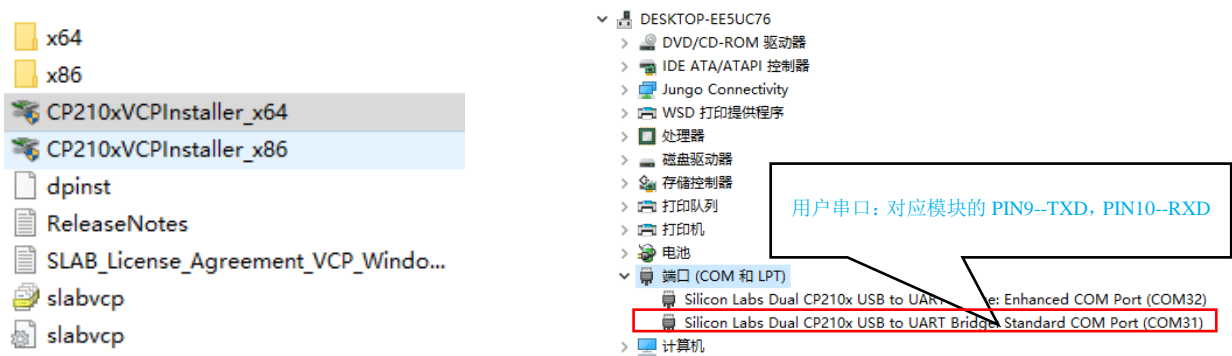■ Install the driver: CP210x_VCP_Windows. After installation, find the serial port in the device manager.

Figure 3.2 Installing the serial port driver

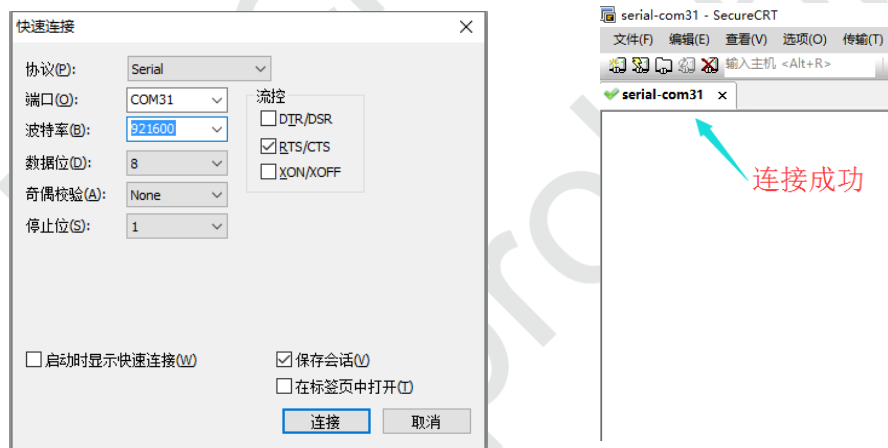■ Open the serial port software SecureCRT.exe, select the user serial port, set the baud rate to 921600.

Figure 3.3 Setting SecureCRT.exe

■ Set the fixture status switch to: BOOT-L, STATUS-H, ELINK-H, then put the EMW110 module into the fixture, press the fixture, and enter the bootloader mode.
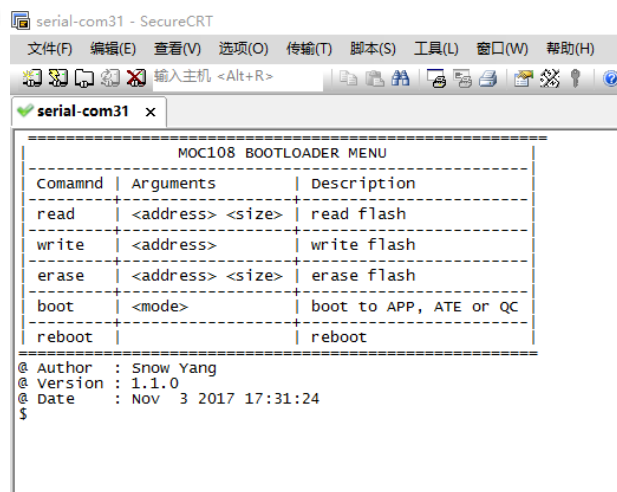
Figure 3.4 Bootloader mode

■   Upgraded firmware：

1. After entering the bootloader mode, enter the command write, that is, enter the programming wait state, as shown in Figure 3.5.

    Note: The command "write" can only burn app.bin, not full bin.

```
========================================================
|                  MOC108 BOOTLOADER MENU              |
|------------------------------------------------------|
| Comamnd | Arguments             | Description        |
|---------+-----------------------+--------------------|
| read    | <address> <size>      | read flash         |
|---------+-----------------------+--------------------|
| write   | <address>             | write flash        |
|---------+-----------------------+--------------------|
| erase   | <address> <size>      | erase flash        |
|---------+-----------------------+--------------------|
| boot    | <mode>                | boot to APP, ATE or QC |
|---------+-----------------------+--------------------|
| reboot  |                       | reboot             |
========================================================
@ Author  : Snow Yang
@ Version : 1.1.0
@ Date    : Nov  3 2017 17:31:24
$ write

waiting for the file to be sent ... (press 'a' to abort)
CC█
```

Figure 3.5 Selecting the upgrade command in the bootloader mode

Note：

    In normal use, BOOT can't be low when it is powered on (the software has been pulled high, don't pull it down on the hardware), combined with STATUS, ELINK to make the module enter different modes (0-low level; 1- high level)).

BOOT	STATUS	ELINK	FUNCTION
0	1	1	BOOTLOADER
1	1	1	APP
0	1	0	ATE
0	0	1	QC

Through the UART (user) serial port pin, you can view the corresponding mode print content. In the APP mode, the mobile phone can be networked and communicate with the APP normally; SRRC, FCC, CE and other authentication must enter the ATE mode; Use QC mode; firmware update via UART must enter BOOTLOADER mode (Boot is pulled low at power-on time, enter this mode).

CHIP_EN is the system enable pin. When this pin is high, the module works normally. If it is low, the module stops working. Please ensure that the pin is high when power is on.

2. Click the "Transfer" button on the toolbar, select "Send Ymodem" from the drop-down menu, in the pop-up dialog box, select the bin file you want to burn, add it to the "Sent Files" area, and finally click " Make sure that the firmware is burned, as shown in the figure below.
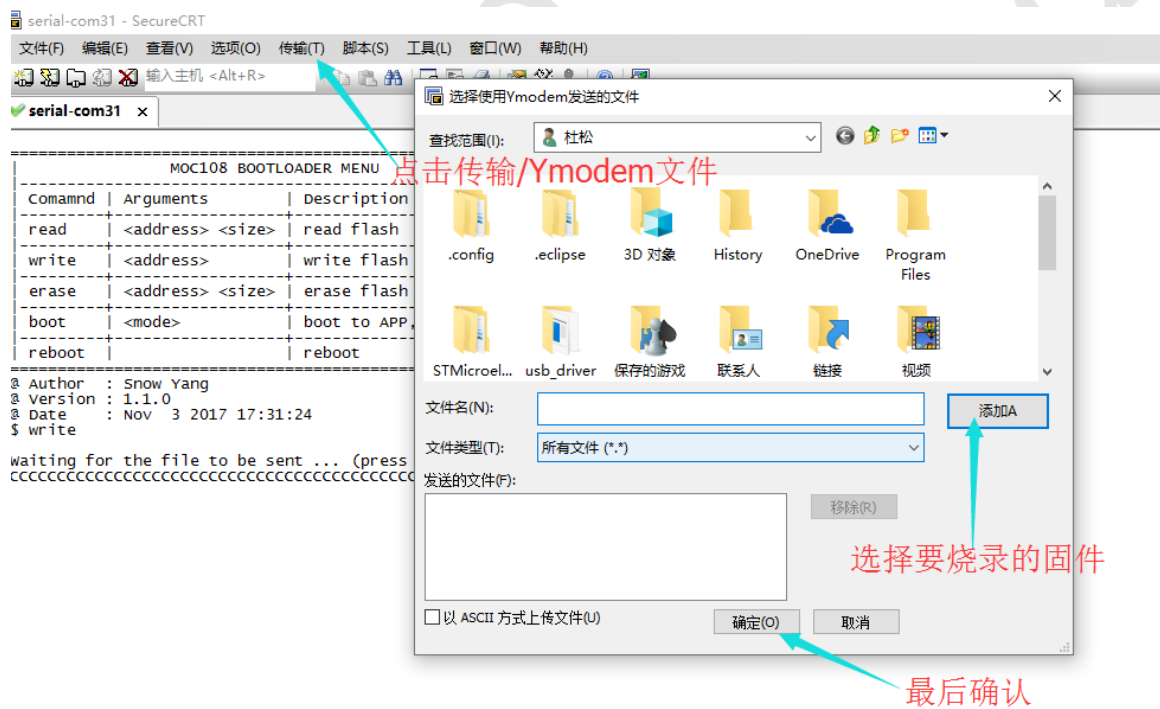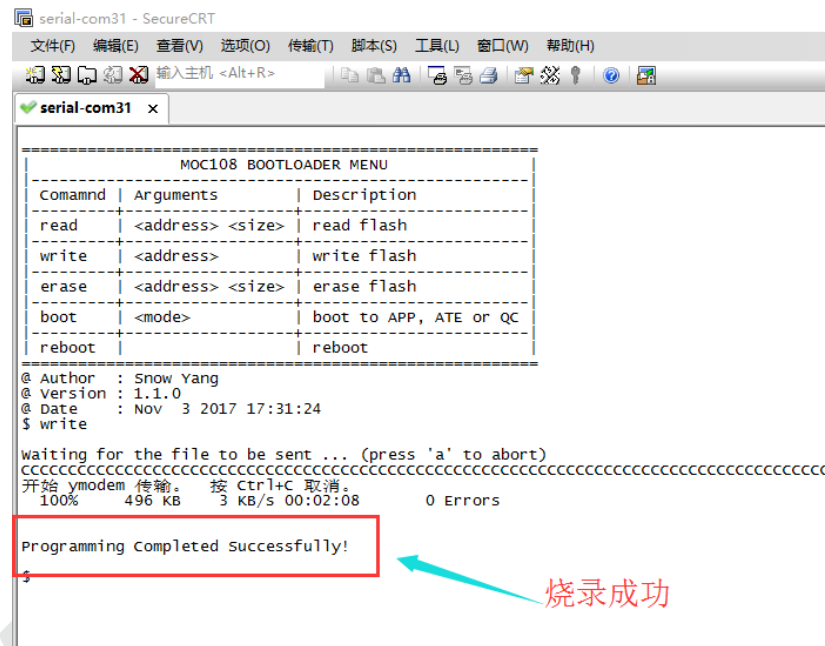
Figure 3.6 Burning process in Bootloader mode

The prompt is successfully burned, that is, the burning is completed.

3.2 Feed testing and production testing of the EMW110
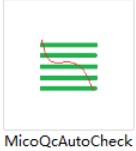
3.1.3 Preparations before testing

Test tool/driver	PC software	note
Tools: computer, EMW110 fixture, Micro USB cable, Wireless router or AP hotspot × 5, Drive：CP210x_VCP_Windows	MicoQcAutoCheck	■ Verify firmware correctness and integrity； ■ Test RF performance and serial port functions

Table 3.2 Tools and Software Required for EMW110 Firmware Measurement

3.1.4 Testing process

① Connect computer, MicroUSB cable, EMW110 fixture, set fixture status switch BOOT-L, STATUS-L, ELINK-H；

Figure 3.7 Connecting and Setting the EMW110 Fixture

② Set the test point and the location of the wireless router or AP hotspot. The distance between the test point and the router is 3~5m.
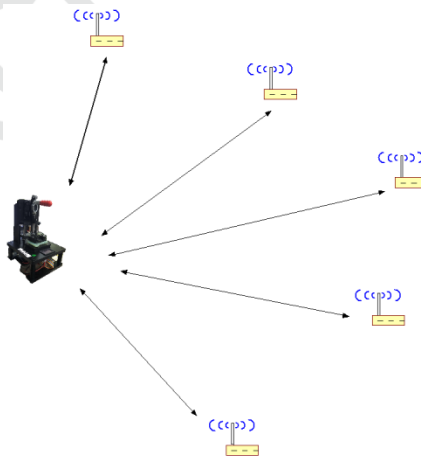

Figure 3.8 Test point and wireless router location setting diagram
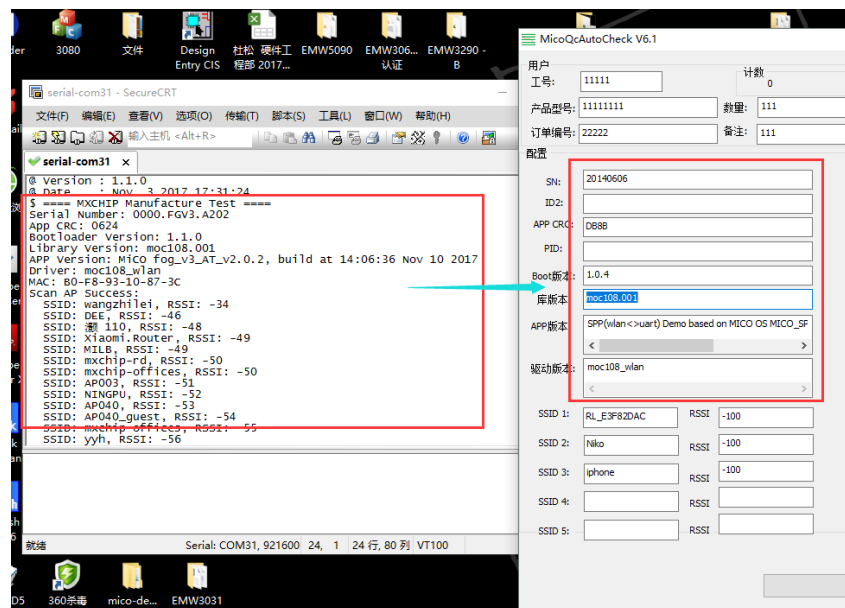
③ Open MicoQcAutoCheck，Fill in the parameters；

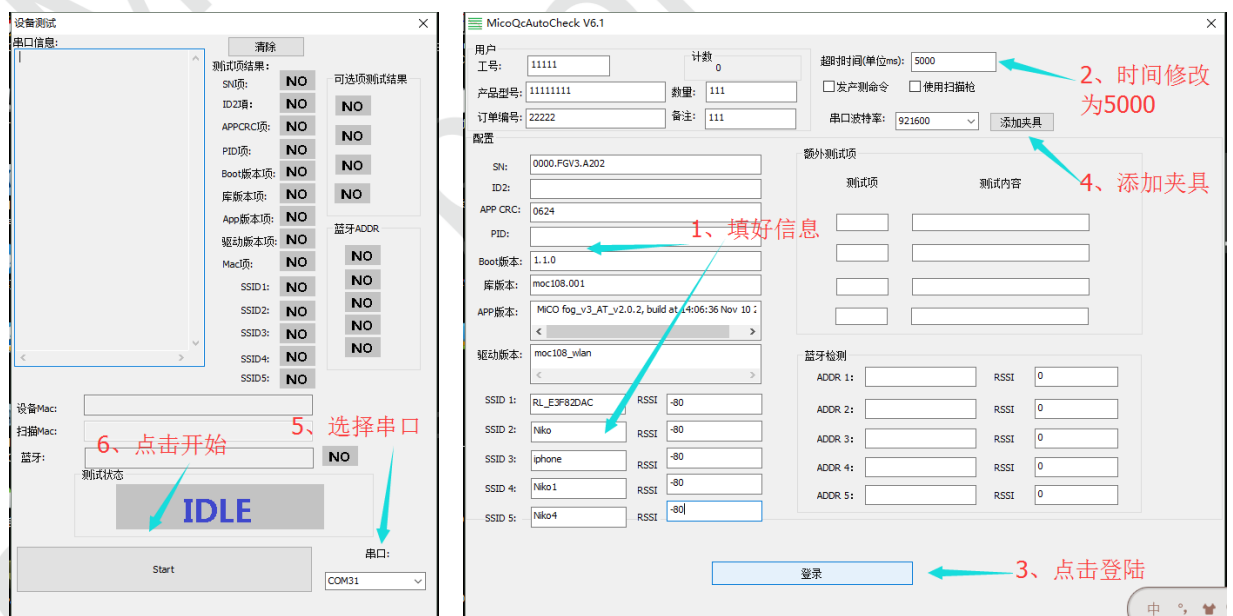Figure 3.9 Setting up MicoQcAutoCheck

④ Then proceed as follows

Figure 3.10 Open the MicoQcAutoCheck test window

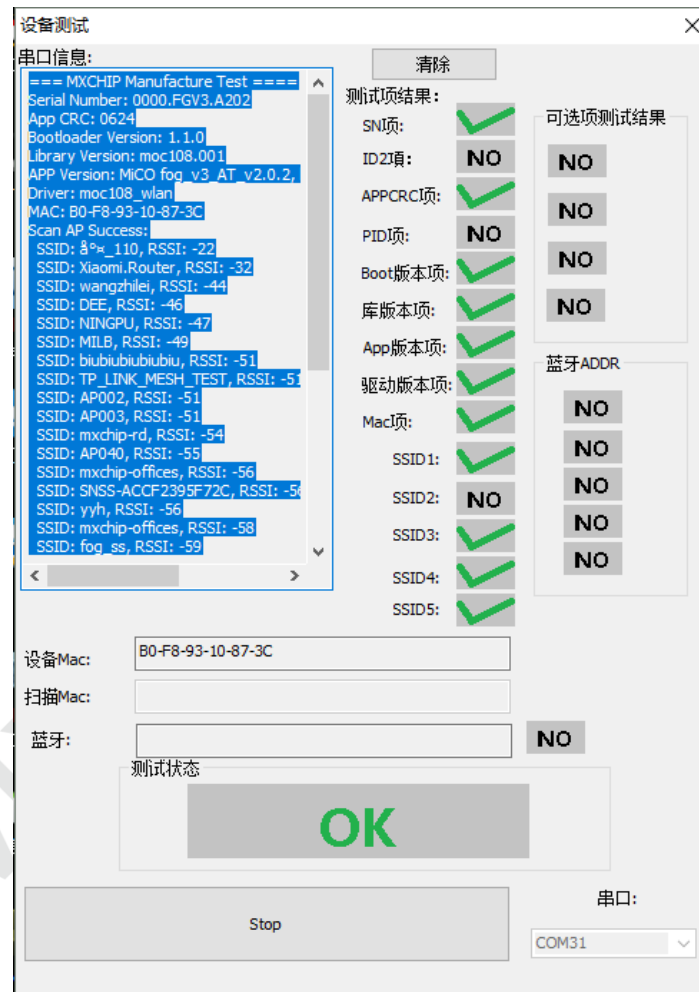Press the clamp to start the test, and the test output is completed.

Figure 3.11 MicoQcAutoCheck output test results

3.2 Important Statement

MXCHIP is obligated to ensure that there are no quality issues with the modules delivered to the customer each batch.

If the customer finds that there is a problem with the module during the sampling, there is a right to request MXCHIP to exchange the goods in time.

MXCHIP is only responsible for compensating the module if the customer does not perform the inbound inspection and causes the module to be soldered to the board.

MXCHIP is obligated to assist customers in resolving various technical issues in firmware development, but will not retain the MVA/bin file for any customer. The customer is obliged to record the individual firmware versions in the firmware development and burn the corresponding firmware version as required before final production.

4. SMT considerations

4.1 Opening steel mesh precautions

Solder mask opening and pad size are the same, SMT recommended steel mesh thickness: 0.15mm, laser grinding open hole.
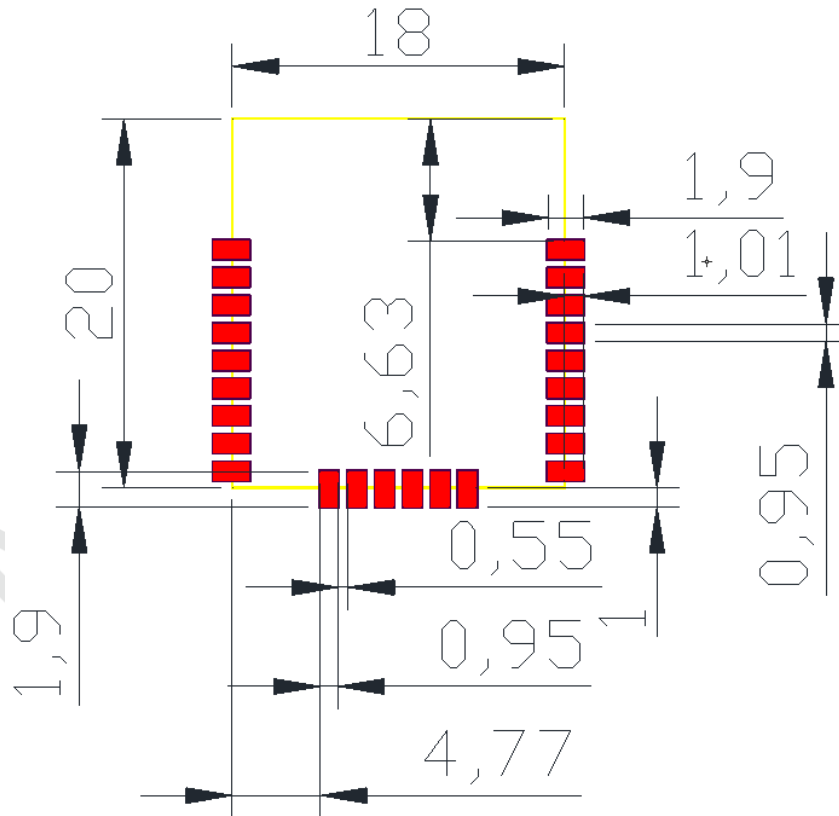

Figure 4.1 Recommended steel mesh size (unit: mm)

4.2 Reflow oven temperature curve

Solder paste type recommended: SAC305, lead free.
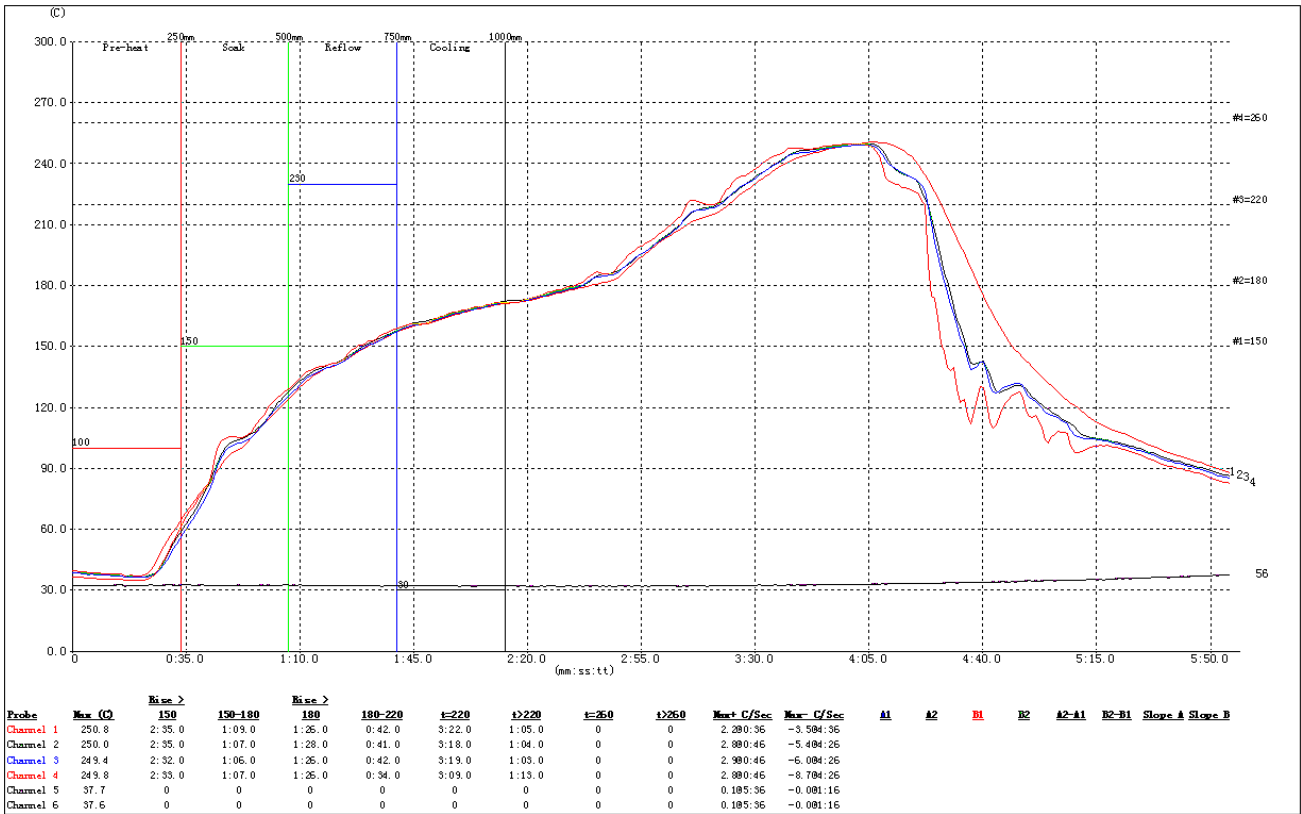
Reflow soldering times ≤ 2 times

Figure 4.2 Reference reflow oven temperature curve

5. Machine production test and firmware upgrade

5.1Machine production test

The WIFI module and the MCU on the board are connected through the serial port. When the firmware of the module is developed, the test command can be directly added to the firmware of the module, and the specified trigger mode is entered into the production test mode. After the trigger, the MCU sends the production test command to the WIFI module. After receiving the command, the WIFI module scans the surrounding hotspots and returns the results through the serial port. This process tests the module's serial communication function with the MCU and the RF function of the module.
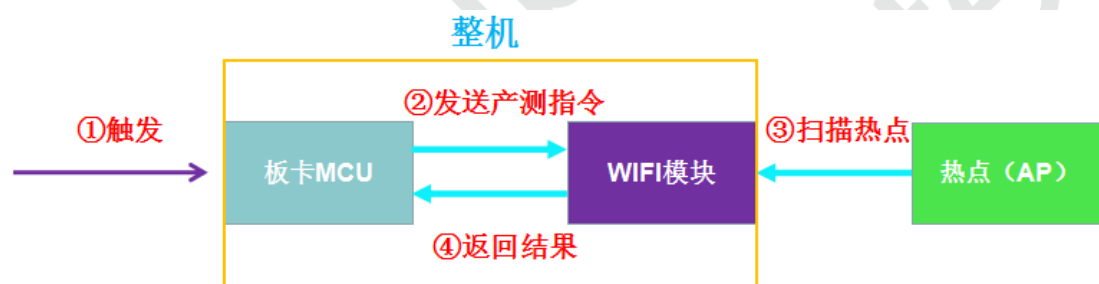
Figure 5.1 Schematic diagram of the whole machine production test

5.1 Firmware upgrade

When the WIFI module has firmware update, the OTA-wireless upgrade mode is adopted, as shown in Figure 5.2.
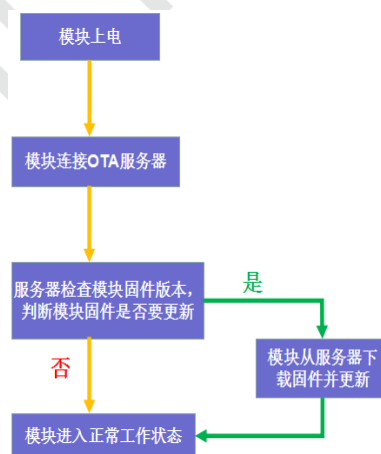
图 5.1 OTA—无线升级固件示意图

6. 服务与支持

如需技术支持或产品咨询，请在办公时间拨打电话咨询上海庆科信息技术有限公司。

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